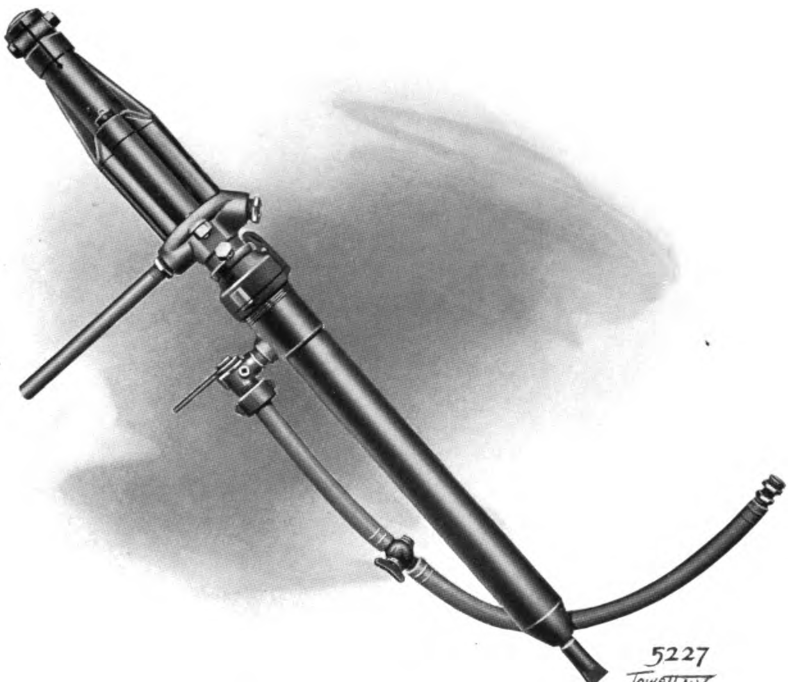
"Imperial" Valveless Telescope Feed Hammer Drill

(Type "MC-22")

Ingersoll-Rand Company

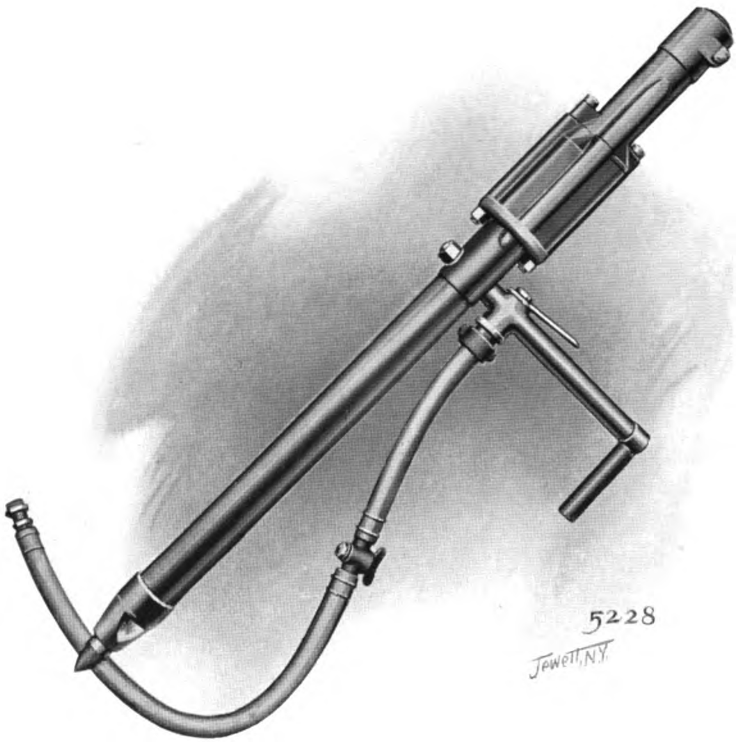
11 Broadway, New York

Form No. 4016 April, 1911



Standard "MC-22" Drill

AMONG the multitude of hammer drills now on the market, there are two basic types into which all may be classified. One is the "valve" type, in which the action of the striking piston, or hammer, is controlled by a separate valve. The other is



Imperial "MC-21" Drill differing from the "MC-22" only in having the Standard Telescope Feed. This is a Special Construction

the "valveless" type, in which the piston or hammer itself performs the valve functions by covering or uncovering ports which control its forward-and-back movement.

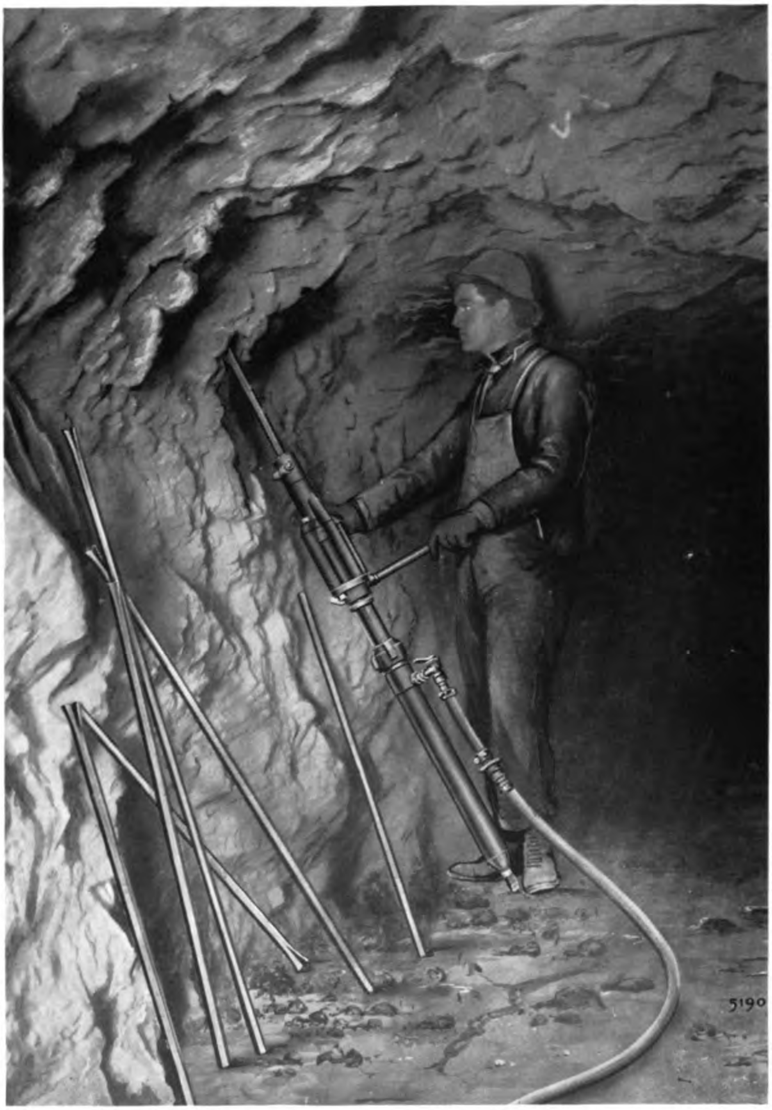
Choice between these two types is largely a matter of personal preference. There are large users of valve drills who would not consider a valveless tool. On the other hand, equally large users are equally strong in their advocacy of the valveless type. The Ingersoll-Rand Company, as manufacturers of both types of hammer drill, are non-partisan in this matter and aim only to furnish the trade with the best machine in either type, as preferred.

The "MC-22" Hammer Drill, the subject of this pamphlet, is a valveless tool and the heaviest one in this type made by the Company. It is intended for stoping, raising and, to a limited extent, drifting. But it is not recommended for steady work in holes at less than twenty degrees above the horizontal, because of the difficulty of cleaning such holes. The great field for the hammer drill is in "uppers", where the holes are self-cleaning; and in this class of work the "MC-22" comes up to every standard.

For years the valveless drill suffered under the stigma of being uneconomical, unreliable, short-lived, and of small capacity. The difficulties, from long repetition, came to be considered inherent and unavoidable in a valveless tool. The shortcomings, however, were the result of poor design and construction, rather than of the valveless principle itself. Soft cylinders and pistons, narrow ports and "bridges", inadequate bearing surfaces, poor materials, careless workmanship—these were the causes of valveless tool troubles, and not the mere absence of a controlling valve.

The "MC-22" Hammer Drill is the result of a conviction, on the part of the Company, that a satisfactory and successful valveless drill could be built; and of a persistent effort to demonstrate the truth of that conviction by producing a valveless hammer drill from which the (so-called) inherent defects had been eliminated. The performance of this improved drill proves the correctness of this conviction, for the machine has realized the most sanguine expectations of its builders and met every requirement of practical work.

A few of the contributing factors may be grouped here, and dwelt upon more fully later: Cylinders and piston of hardened and ground steel; very generous bearing and wearing surfaces; large ports and wide bridges; through bolts replacing screwed cylinder connections; large reduction in the number of screwed joints, by machining parts from steel forgings; special grades of steel used; splendid workmanship; automatic lubrication; extreme simplicity due to small number of parts. All of these features are to be compared with the cheap, make-shift construction of other valveless hammer drills. THE



Drilling an upper with the "MC-22" Drill

COMPANY UNHESITATINGLY OFFERS THE "MC-22" AS THE BEST VALVELESS HAMMER DRILL ON THE MARKET TODAY; and any unbiased comparison will justify this claim.

As to economy, two elements enter into hammer drill efficiency—cost of up-keep, and air consumption. As to cost of up-keep on the "MC-22", its construction is such that it will probably outwear and outlast any valveless hammer drill on the market today. The air consumption of the "MC-22" is less than that of any other hammer drill today offered to the trade.

The telescope feed of the "MC-22" is that designated by the Company as the "reversed feed" type, in which the inner, or piston, tube is attached to the drill, and the outer, or cylinder, tube runs out under pressure. The advantage of this arrangement is that the hose is stationary—not turning with the drill; and the tool may be used on a tripod or column by clamping the outer feed cylinder to the mounting. The "Standard feed", in which the outer tube is attached to the drill, can be furnished on special order.

Some Notes of General Construction

In the "MC-22" the ideal has been a *sustained* economy, not merely an initial or test economy. With this in view, the possibilities of various materials have been made a special study, in order that every wearing part might have the greatest possible resistance to wear, thus guarding against leakage and loss of efficiency. In probably no other hammer drill has greater care been given to the selection of materials. The front and back cylinders are made from steel drop forgings, case hardened and accurately ground to size. The nozzle (or chuck), the anvil block and the piston (or hammer) are made of tungsten vanadium steel, hardened. In other parts selected steels of the best quality and of special characteristics are used.

The air ports and passages are very large—a great advantage where dirt is to be encountered, as foreign matter entering the tool is blown out and does not clog the action. This feature also makes

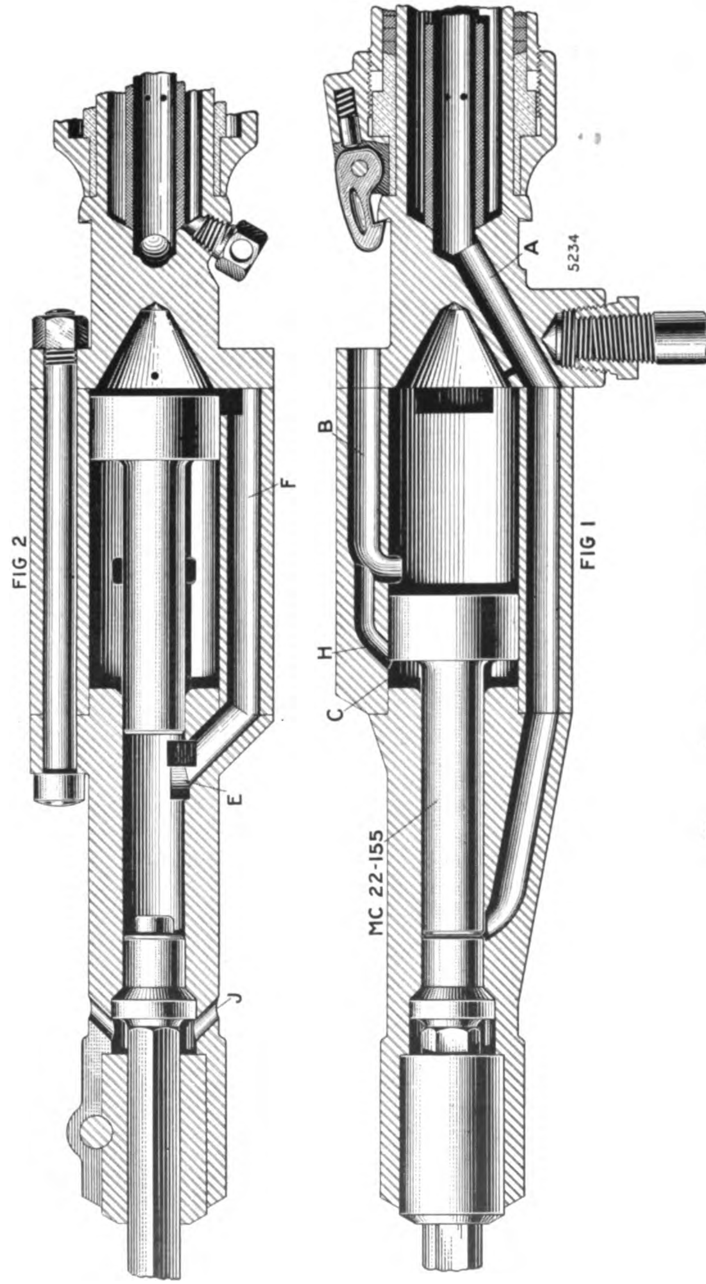


Diagram of action of Imperial "MC-22" Drill

a very quick-acting, powerful tool, with no delayed action due to inadequate air passages.

All threads used are of A. L. A. M. Standard—a great advantage in a machine subjected to such great vibration as the hammer drill. Through-bolts are of generous proportions and this means of holding together the parts is in line with the most modern practice.

The "MC-22" uses all styles of plain, solid, shankless steels, the anvil block interposing between hammer and butt of steel. Nozzles or chuck bushings can be furnished to take square, hexagon or cruciform steel and orders should designate size and style of steel to be used.

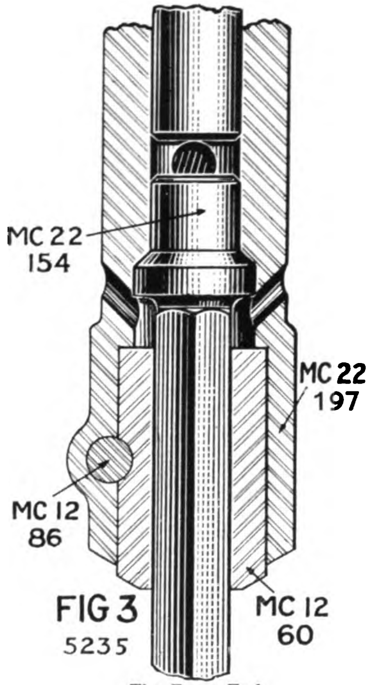
The Working of the Drill

Referring to Fig. 1, the sectional illustration herewith. Live air enters from the feed cylinder through port "A" and is carried to the front of the piston "MC-22-155", where it is at full pressure at all times. The illustration shows the piston ready for its back or return stroke. The live air at the front forces the piston back, the exhaust from behind it passing out through ports "B" until the latter are closed by the head of the piston.

The piston is moved back until port "E", Fig. 2, is uncovered, when live air is admitted to the top of the piston through the port "F". As the area of this face of the piston is greater than that of the opposite face or striking end, the piston is forced forward. Live air is shut off on the forward stroke as soon as the piston passes over port "E". The piston then is forced forward by expansion of the air until its head uncovers the exhaust port "B" just as the blow is struck on the steel.

The drill may be run without injury even with no steel in place, for an air cushion is formed in the chamber "C" as soon as the piston covers the exhaust port "H".

It is impossible for dirt to work its way into the drill through ports "J" or around the steel, as there is just enough leakage around the anvil block, due to vibration, to allow live air to blow out.



The Front End

The Front End

Referring to the illustration, Fig. 3, the construction of this important part is plain. The cylinder, "MC-22-197", is fitted with a chuck bushing or nozzle, "MC-12-60", which is held in place and prevented from turning by a bolt, "MC-12-86". The latter passes through the cylinder and engages a groove in the side of the nozzle. The cylinder is slotted to allow it to be drawn up tight, holding the nozzle firmly in position. This construction makes it easy to change nozzles for various sections of steels and to remove the anvil block, "MC-22-154".

The Telescope Air Feed

This is a very simple construction shown in Fig. 4, consisting of the outer tube or cylinder, "MC-22-135", and the inner tube or feed piston, "MC-22-120". Both tubes are made from steel forgings, in a solid piece, with no screwed joints to work loose; and this makes an exceptionally strong and rigid construction.

The spud, "MB-12-50", is screwed directly into the pointed end of the outer tube. On the other end of this tube is screwed the packing nut or stuffing box, "MC-22-122", which is illustrated and described later. An oiler "C" is screwed into the interior of the inner tube, this detail also being described later.

In operation, air is taken into the inlet "A" and passed between the inner and outer feed tubes until it reaches port "B", where it enters the inner tube and passes thence to the hammer. Into the end of the inner tube is fastened a plate "C". There is sufficient clearance

between the head "D" of the inner tube, and the inner wall of the outer tube to allow air to pass into the chamber "E". This forces the air feed open. When the ports "B" pass under the shoulder "F" of the outer tube, air is shut off from the hammer. But the air feed is still under pressure and will remain so until relieved through a bleeder in the throttle. Particular attention is called to the fact that when the air feed is fully run out, air is automatically shut off from the drill. This prevents damage and adds to the life of the tool.

The working area of the air feed is the area of the inner tube at its small diameter, at "H". In cases where this gives too strong a feed, the Company can provide for other conditions, on order, by reducing the diameter of the inner tube at "H". This necessitates a special packing gland and packing.

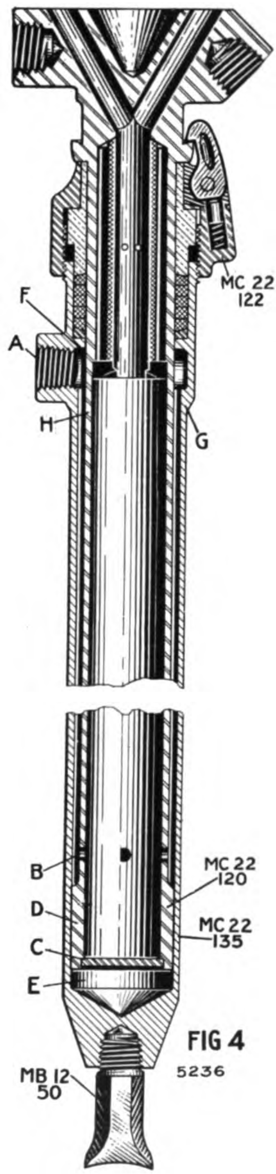
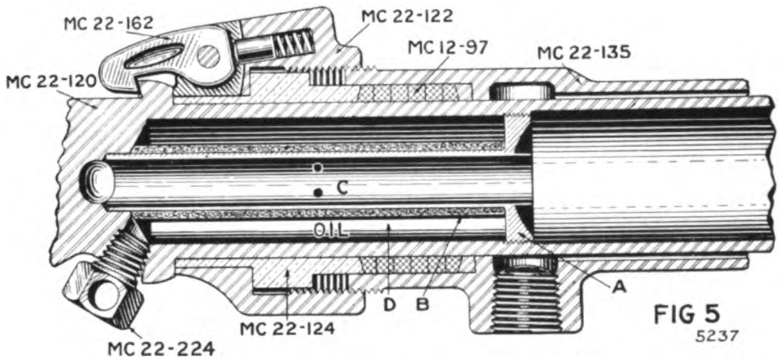


FIG 4

Section of the Telescope Air Feed

The Oiler

Inside of the inner tube, "MC-22-120", is screwed the oil tube "A" over which is pressed a round lamp wicking "B", Fig. 5. A series of holes "C" are drilled around the oil tube. Through this tube the air passes to the hammer. The oil chamber "D" is filled with oil by removing the oil hole plug, "MC-22-224". About three teaspoonfuls will run the drill for three shifts.



Oiler, Feed Packing Nut and Feed Lock

The wicking will take up the oil much the same as the wick of a lamp. When the drill is running, air pressure is in the oil chamber "D". As soon as the drill stops, this pressure is relieved and the air "D" expands through the holes "C", carrying with it the oil in the wick around the ports. On starting up, this oil is carried into the drill and is sufficient to keep the machine well lubricated.

The Air Feed Packing Nut

In this detail (Fig. 5) the outer tube, "MC-22-135", is screwed to the packing nut, "MC-22-122". The latter is adjustable, taking up the packing, "MC-12-97", by means of the bronze packing gland, "MC-22-124". This gland is keyed to the outer tube to prevent its rotation under the rocking back and forth of the hammer.

Particular attention is called to the fact that if the regular packing is not available, candle wicking, rope or old waste can be used temporarily. This style of packing is much more easily replaced than cup leathers.

The Feed Lock

Referring to Fig. 5, the telescope air feed is locked, when run in, by means of the feed lock "MC-22-162" which is fastened to the packing nut "MC-22-122". This engages automatically over the

shoulder on the inner tube "MC-22-120" when the feed is closed, making the drill easy to handle.

Positions of the Throttle

On the "MC-22" Drill there are three major positions for the throttle lever (Fig. 6). No. 1 is the closed position, air being shut off entirely from telescope air feed and hammer. No. 2 is the middle position, for starting a hole with moderate feed pressure and moderate drilling speed. No. 3 is the full running position with full feed pressure and maximum drilling speed. Between these major positions intermediate speeds and pressures may be had.

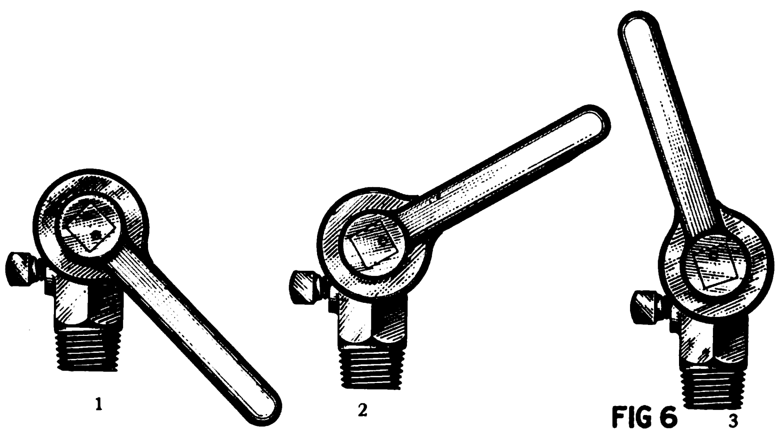


FIG 6
5238

Positions of the Throttle

Hose Equipment and Couplings

Each "MC-22" Drill is fitted with a short length of hose as shown in Fig. 7. The end "A" is screwed to the throttle and the end "C" to the main hose line. Thus, by shutting off the stop-cock "B", the drill may be disconnected from the hose line at "A" without shutting off the main line.

This hose may be connected at "C" with the standard ¾-inch Ingersoll-Rand Hammer Drill Coupling, or, by means of a standard bushing with the standard 1-inch Ingersoll-Rand Rock Drill Coupling.

Equipment

Each "MC-22" Drill outfit includes a drill complete with telescope air feed and the hose equipment as described, together with such fittings as may properly go with the machine in the way of throttle, rotating handle, wrenches, etc. No hose, mountings, or steels are a part of the regular equipment.

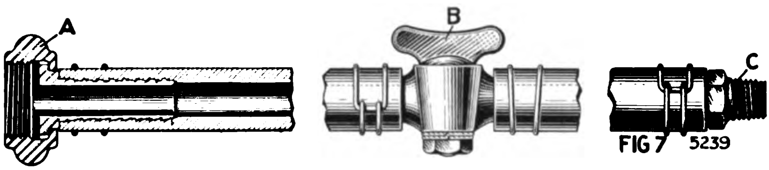


FIG 7 5239

Specifications

The following brief list presents the important dimensions and other data relating to the "MC-22" Hammer Drill:

Piston Diameter	$1\frac{3}{16}$ and $2\frac{1}{2}$ inches
Stroke	4 inches
Length of Feed	20 inches
Length of Drill, closed	50 inches
Length of Drill, open	70 inches
Weight boxed	100 lbs.
Weight unboxed	65 lbs.
Size of Air Supply	$\frac{3}{4}$ inches

The following air consumptions have been recorded for these tools:

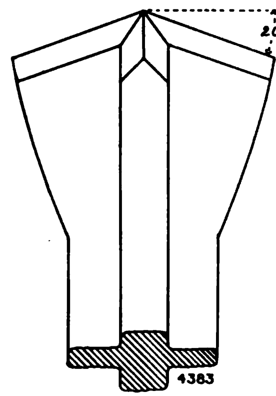
Air Pressure	Cubic Feet Free Air Per Minute
60	27
70	30
80	34
90	39
100	45

Size and Style of Bit

Experience has demonstrated that in hammer drill work a bit with a high center gives the best result; and the steels listed on page 14 are furnished with the bit "crowned" as indicated in the sketch.

The Company recommends the use of large bits and heavy steels, as giving more satisfactory drilling results and better breaking of the ground. A hole bottomed to take $1\frac{1}{4}$-inch powder will evidently

break more rock than one bottomed for 1-inch powder. Probably five or six holes bottomed for the larger powder will break as much ore as eight or nine holes bottomed for only 1-inch powder. This means less proportionate drilling time for a given amount of breaking, with greater headway made, and fewer steels to sharpen and transport. Rotation is also made easier.



A "Crowned" Hammer Drill Steel Bit

This general statement, while true so far as large stopes and large raises are concerned, must be qualified where narrow veins are to be followed or where the ground is such that heavy charges would pulverize the ore or shatter the walls. In the latter case smaller holes will serve, and a smaller steel and bit may be used.

The cut shows standard sections of cruciform steel. Squares or hexagons can also be furnished. The size to be used should be specified when ordering drills. Chuck bushings, or nozzles, will be made for any section of steel. When special sections are wanted a sample of the steel should be submitted with order.

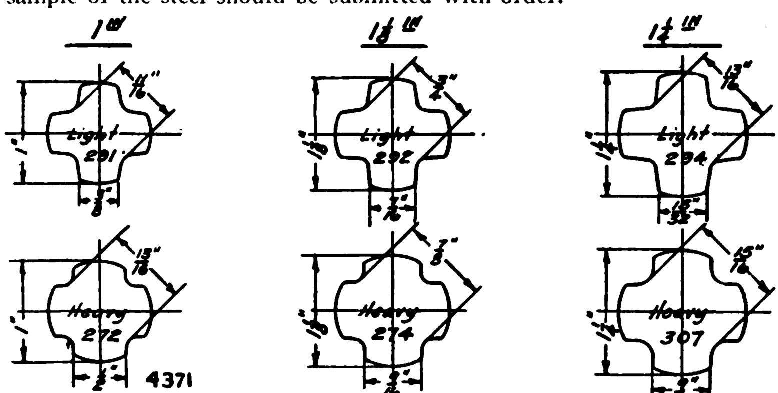
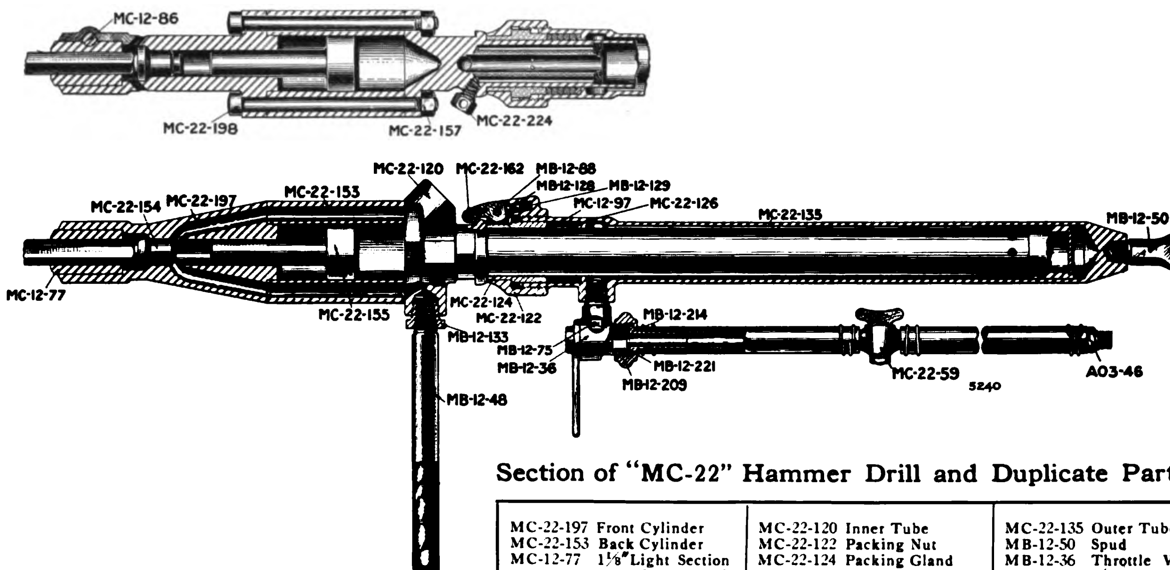


Diagram Showing Relative Cross Sections of "Light" and "Heavy" Cruciform Steels in Three Standard Sizes

HEAVY CRUCIFORM HAMMER DRILL STEELS

All the steels here listed are SOLID steels, for UP holes only, with 4-POINT CROSS bits and WITHOUT SHANK AND COLLAR

Drilling Length Exclusive of Length in Chuck, Inches	Diam. of Bit Inches	Approx. Weight Per Steel, Lbs.	List Price Per Single Steel	List Price Per Set	Telegraph Name of Set	Diam. of Bit, Inches	Approx. Weight Per Steel, Lbs.	List Price Per Single Steel	List Price Per Set	Telegraph Name of Set	Diam. of Bit, Inches	Approx. Weight Per Steel, Lbs.	List Price Per Single Steel	List Price Per Set	Telegraph Name of Set
Standard 6-in. Run	Heavy 1-In., for MA, MB / HA, HB Drills Sec. 272					Heavy 1⅛-In., for MB, MC / HB, HC Drills Sec. 274					Heavy 1¼-In., for MC / HC Drills Sec. 307				
6	1¾	2½	$0.90		Volemilca	2	3⅛	$1.00		Volemimago	2⅛	3½	$1.05		Voleminhos
12	1 11/16	3¾	1 00	$1.90	Volemile	1 15/16	4⅝	1.15	$2.15	Volemimeca	2 1/16	5¼	1.25	$2.30	Volemini
18	1⅝	5	1.10	3.00	Volemilega	1⅞	6¼	1.30	3.45	Volemiment	2	7	1.45	3.75	Voleminien
24	1 9/16	6¼	1.20	4.20	Volemilejo	1 13/16	7⅞	1.45	4.90	Volemimes	1 15/16	8¾	1.60	5.35	Voleminina
30	1½	7½	1.30	5.50	Volemilete	1¾	9⅜	1.60	6.50	Volemimian	1⅞	10½	1.75	7.10	Voleminize
36	1 7/16	8¾	1.40	6.90	Volemilhao	1 11/16	11	1.75	8.25	Volemimila	1 13/16	12¼	1.90	9.00	Voleminoid
42	1⅜	10	1.50	8.40	Volemilhem	1⅝	12½	1.90	10.15	Volemimor	1¾	14	2.05	11.05	Voleminola
48	1 5/16	11¼	1.60	10.00	Volemiliam	1 9/16	14	2.00	12.15	Volemimuda	1 11/16	15¾	2.20	13.25	Voleminoso
54	1¼	12½	1.70	11.70	Volemilid	1½	15⅝	2.10	14.25	Voleminae	1⅝	17½	2.35	15.60	Volemio
60	1 3/16	13¾	1.80	13.50	Volemilimo	1 7/16	17⅛	2.20	16.45	Volemincor	1 9/16	19¼	2.50	18.10	Volemiogmo
Standard 12-in. Run															
12	1 11/16	3¾	1.00		Volemillez	1 15/16	4⅝	1.15		Voleminelo	2 1/16	5¼	1.25		Volemionar
24	1 9/16	6¼	1.20	2.20	Volemillis	1 13/16	7⅞	1.45	2.60	Voleminer	1 15/16	8¾	1.60	2.85	Volemionda
36	1 7/16	8¾	1.40	3.60	Volemillum	1 11/16	11	1.75	4.35	Volemineta	1 13/16	12¼	1.90	4.75	Volemionem
48	1 5/16	11¼	1.60	5.20	Volemilogo	1 9/16	14	2.00	6.35	Volemingai	1 11/16	15¾	2.20	6.95	Volemionne
60	1 3/16	12¾	1.80	7.00	Volemilos	1 7/16	17⅛	2.20	8.55	Volemingo	1 9/16	19¼	2.50	9.45	Volemions



Section of "MC-22" Hammer Drill and Duplicate Part List

MC-22-197	Front Cylinder	MC-22-120	Inner Tube	MC-22-135	Outer Tube
MC-22-153	Back Cylinder	MC-22-122	Packing Nut	MB-12-50	Spud
MC-12-77	1⅛" Light Section Cruciform Nozzle	MC-22-124	Packing Gland	MB-12-36	Throttle Valve (complete)
MC-22-154	Anvil Block	MC-22-126	Packing Ring	MB-12-209	Hose Nut
MC-22-155	Piston	MC-12-97	Pack'g H'd Pack'g	MB-12-214	Hose Nipple
MC-22-198	Side Rods	MC-22-162	Air Feed Lock	MB-12-221	Leather Washer
MC-12-86	Barrel Bolt	MB-12-88	Air Feed Lock Pin	MB-12-75	Oil Hole Plug
MC-22-157	Side Rod Nuts—Barrel Bolt Nut	MB-12-128	Feed Lock Latch Pin	MC-22-59	Stop Cock
MB-12-48	Rotating Handle	MB-12-129	Feed Lock Latch Pin Spring	AO-3-46	Hose Nipple
MB-12-133	Rotating Handle Bushing	MC-22-224	Oil Hole Plug	MC-22-27	Wrench

The "MC-22" Hammer Drill Drifting in a Mine

The MASON-HENRY Press
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